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(54) Broadcast system and terminal for receiving and reproducing broadcast signals

(57) A broadcast system for allowing a receiving/reproducing terminal to cyclically reproduce high data-rate data even when using a communication infrastructure having a low transmission data rate is described. Program data to be reproduced in real time and content data are transmitted from a transmitting apparatus. The total data rate is divided into a first period and a second period. During the first period, the receiving/reproducing terminal reproduces the program data, such as character-based data, in real time, and also stores the content data in a memory. In the second period, the receiving/reproducing terminal reads the data stored in the memory, and based on this data and certain second period content data, the high data-rate data is reproduced.

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Description

BACKGROUND OF THE INVENTION

1. FIELD OF THE INVENTION

[0001] The present invention relates to a generally to a broadcast system, and more specifically to a receiving/reproducing terminal which utilizes a transmission system having a relatively low data transmission rate.

2. DESCRIPTION OF RELATED ART

[0002] Broadcast systems for transmitting high-quality images and sound to viewers in real time, such as, terrestrial television broadcast systems, satellite broadcast systems implemented by broadcasting satellite (BS) or communications satellite (CS), cable television (CATV) systems implemented by cable networks, and so on, have been put into widespread practical use.

[0003] However, in the above types of broadcast systems, the cost for starting a broadcast business and producing content and broadcasting programs is typically quite high. Furthermore, a large-scale transmitting system is usually required. This imposes a heavy restriction on the implementation of broadcast business, and often requires obtaining legal authorization. Additionally, a relatively large antenna and hardware are typically required for selectively receiving high-quality images and sound, and for reproducing them by using a display unit and a sound output unit. It is very difficult to integrate such a large antenna and hardware into a portable receiving/reproducing terminal. Accordingly, in general, receiving/reproducing apparatuses for receiving and reproducing high-quality images and sound must be installed indoors.

[0004] Portable machines, such as cellular telephones, personal handyphone system (PHS) terminals, and portable information communication devices (i.e., personal digital assistants (PDA), which may sometimes include cellular telephones and PHS terminals), are coming into widespread use. Additionally, information other than sound, such as electronic mail, is actively communicated by utilizing the infrastructure of the above-mentioned portable machines. Machines that can be used as a broadcasting infrastructure (system), such as beepers, are also available.

[0005] In the machines that exhibit advantageous portability, such as the beeper system described above, the data rate is typically too low to receive and reproduce high quality images with sound. Apart from sound data, such portable machines are generally used only for transmitting and receiving character-based (textual) information.

[0006] In the following description, the term "content" means various information, such as pictures, images (both moving pictures and still images), sound, characters, numerical data, and so on, and includes programs reproduced by television receivers and radio receivers, commercials (CM), magazines, and newspapers.

SUMMARY OF THE INVENTION

[0007] In view of the above background, it is an object of embodiments of the present invention to provide a broadcast system and a receiving/reproducing terminal that reproduce images (both moving pictures and still images) in real time for a certain period of time, even if an infrastructure for use in the above broadcast system or receiving/reproducing terminal has a relatively low data rate.

[0008] In order to achieve this object, according to one aspect of the present invention, there is provided a broadcast system for transmitting and receiving content as data in real time. The broadcast system includes a transmitting apparatus for transmitting the data at a fixed transmission data rate. A receiving/reproducing terminal receives the data and reproduces the content by cyclically increasing or decreasing a reproduction data rate.

[0009] As stated above, the reproduction data rate is cyclically increased or decreased. With an increased reproduction data rate, data requiring a high data rate, such as image data, can be reproduced in real time as content. With a decreased reproduction data rate, data that can be reproduced even at a low data rate, such as character data, can be reproduced in real time as content.

[0010] In one embodiment, the transmitting apparatus transmits the data by dividing the data into time units, each of the time units being divided into a first period and a second period. First-period data and second-period first data may be transmitted in the first period, and second-period second data may be transmitted in the second period. The receiving/reproducing terminal may receive the first-period data and the second-period first data in the first period, and may receive the second-period second data in the second period.

[0011] The receiving/reproducing terminal may include a storage device, and in the first period, the receiving/reproducing terminal may reproduce the received first-period data in real time and also store the received second-period first data in the storage device. In the second period, the receiving/reproducing terminal may read the second-period first data from the storage device and may reproduce the content from the read second-period first data and the second-

period second data.

[0012] For this embodiment, image data may be used as the second-period first data, and command data for reproducing the image data may be used as the second-period second data. Accordingly, in the second period, the image corresponding to the image data can be reproduced on the receiving/reproducing terminal based on the command data. In this case, in the first period, character data, which is a relatively low data-rate data, can be received and reproduced in real time.

[0013] According to another aspect of the present invention, there is provided a receiving/reproducing terminal including a data receiving unit for receiving content as data in real time at a fixed data rate. A data reproducing unit reproduces the content from the received data by cyclically increasing or decreasing the data rate. With this arrangement, with an increased reproduction data rate, data requiring a high data rate, such as image data, can be reproduced in real time as content. With a decreased reproduction data rate, data that can be reproduced even at a low data rate, such as character data, can be reproduced in real time as content.

[0014] Other objects, features, and advantages of the present invention will be apparent from the accompanying drawings and from the detailed description that follows below.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The present invention is illustrated by way of example and not limitation in the figures of the accompanying drawings, in which like references indicate similar elements, and in which:

Figure 1 is a diagram illustrating the configuration of a broadcast system incorporating an embodiment of the present invention;

Figure 2 is a block diagram illustrating the electrical configuration of a receiving/reproducing terminal according to an embodiment of the present invention;

Figure 3 is a plan view illustrating the external configuration of a receiving/reproducing terminal according to an embodiment of the present invention;

Figure 4 is a diagram illustrating an example of a program schedule and divided data rates;

Figure 5 is a flow chart illustrating the receiving and reproducing process performed by a receiving/reproducing terminal, according to one embodiment of the present invention; and

Figure 6 is a diagram illustrating a sequence of outputting high data-rate data, such as images, in real time for a certain period of time by utilizing a low data-rate transmitting infrastructure.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0016] A broadcast system and a receiving/reproducing terminal for reproducing broadcast content in real time are described. In the following description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be evident, however, to one of ordinary skill in the art, that the present invention may be practiced without these specific details. In other instances, well-known structures and devices are shown in block diagram form to facilitate explanation. The description of preferred embodiments is not intended to limit the scope of the claims appended hereto.

[0017] Referring to the system configuration of a broadcast system 10 according to an embodiment of the present invention shown in Figure 1, a known public-line network 12 and a beeper system 14 are used as communication infrastructures. Although, in practice, the beeper system 14 includes a central station and a base station, a transmitting apparatus (also referred to as the "transmitting station") 18 having a transmitting antenna 16 serves as both the central station and the base station for simple representation.

[0018] One or more portable receiving/reproducing terminals 20A, 20B, and 20C (indicated as element 20 when referring to each terminal individually) having different addresses are distributed within the zone or area in which radio waves emitted from the transmitting antenna 16 extend. If the receiving/reproducing terminals 20A, 20B, and 20C are used in a manner similar to a television receiver or a radio receiver, the provision of different addresses is not necessary.

[0019] The transmitting apparatus 18 for use in the beeper system 14 is connected to the public-line network 12, and a terminal (computer terminal) 22 of a content producer (content provider) and a terminal (computer terminal) 24 of a company are connected to the public-line network 12.

[0020] Program data, which is content data, transmitted from the content-provider terminal 22 is supplied to an editing terminal (also referred to as a "program editing terminal" or an "editing computer") 26 disposed within the transmitting apparatus 18 via the public-line network 12. Commercial (CM) data, which is content data, transmitted from the company terminal 24 is also supplied to the program editing terminal 26 via the public-line network 12.

[0021] Such content data is edited by the program editing terminal 26 and is transmitted over radio waves via a

transmitter 28 and the transmitting antenna 16. In this embodiment, the transmission data rate is 6.4 kbps according to the FLEX-time diversity (FLEX-TD) method which is employed for beepers. The term "data rate" is also referred to as the "transmission capacity" or the "bandwidth."

[0022] Figure 2 is a block diagram illustrating the basic configuration of the electrical circuit of the receiving/reproducing terminal 20 for use in the broadcast system 10.

[0023] Figure 3 is a plan view illustrating the receiving/reproducing terminal 20. Although various types of beeper receivers may be used as the receiving/reproducing terminal 20, a specific terminal is illustrated for this embodiment.

[0024] The external configuration of the receiving/reproducing terminal 20, for one embodiment of the present invention, is as shown in Figure 3. Operation keys 78 include a canceling key 78Ca, a cross key 78Cr, a setting key 78D, and a mode switching key 78M (which are discussed in detail later), a liquid crystal display (LCD) device 74, and a flexible antenna 50 are attached to a casing having a flat bottom and formed generally in an oval shape. The receiving/reproducing terminal 20 is flat and thin-walled, and is approximately the same size or smaller than a person's palm as viewed from the front side.

[0025] The receiving/reproducing terminal 20 includes, as shown in Figure 2, a control unit 40, such as a microcomputer. A central processing unit (CPU) 44 for use in the control unit 40 controls the entire system of the receiving/reproducing terminal 20. The individual blocks are connected to a system bus 46 which is managed by the CPU 44. The CPU 44 includes a read only memory (ROM) for storing a control program, such as a kernel, a random access memory (RAM) used for a work area (serves as a memory device for temporarily storing data and calculation results required by the processing of the CPU 44), and a timer (counting device).

[0026] The communication input path of the receiving/reproducing terminal 20 is formed of a receiving antenna 50, a radio frequency (RF) processor 52, a decoder 54, and a serial-to-parallel interface (SPI) 56 for convening serial signals into parallel signals.

[0027] In this case, radio waves including content data transmitted as broadcast waves from the transmitting apparatus 18 shown in Figure 1 are received by the receiving antenna 50. After the RF signal is converted into an intermediate frequency (IF) signal by the RF processor 52, the IF signal is demodulated and is decoded into serial data by the decoder 54. The serial data is then convened into parallel data by the SPI 56 and is output to the system bus 46.

[0028] A data memory (storage device) 62 having, for example, a 16 MB capacity, which serves as an external storage device, is connected to the system bus 64 via a corresponding memory interface 60.

[0029] A digital-to-analog converter (DAC) 64 for converting a digital sound signal into an analog signal is also connected to the system bus 46, and the converted analog signal is output from a speaker 68, which serves as a sound output device, via an amplifier 66.

[0030] A graphic display controller (GDC)/decoder 70, which serves as both an image processor and a decoder, is connected to the system bus 46. Further, a liquid crystal display (LCD) 74, such as a thin-film transistor (TFT) color liquid crystal display device, is connected to the system bus 46 via a liquid crystal display controller (LCDC) 72. The operation keys 78 are also connected to the system bus 46 via a switch interface 76.

[0031] As stated above, the operation keys 78 are formed of the cross key 78Cr having the function of selecting a received broadcast channel and selecting characters, the setting key 78D, the canceling key 78Ca, and the mode switching key 78M for switching between a broadcast receiving mode and a beeper mode. The above-mentioned keys may have complex functions, and one may also serve as a power key (on/off key). However, the power key is preferably provided separately from the above keys.

[0032] Although a specific layout for a receiving/reproducing terminal 20 has been described and illustrated, it should be noted that various different types and sizes of receiving/reproducing terminals can be used in different embodiments of the present invention.

[0033] In one embodiment of the present invention, the operation of the broadcast system 10 constructed as described above is as follows.

[0034] Content data, such as a program produced by a content provider using the terminal 22 (referred to as the "program data Dp") is transmitted to the editing terminal 26 of the transmitting apparatus 18 via the public-line network 12. Content data, such as CM data, produced by a company using the terminal 24 (referred to as the "CM data Dcm") is also transmitted to the program editing terminal 26 via the public-line network 12.

[0035] By using the program data Dp and the CM data Dcm as broadcast material, the program editing terminal 26 produces, as shown in Figure 4, a program schedule 100 by using 15 minutes as a time unit (TU). The program editing terminal 26 divides the program schedule 100 into time units (TU) and continuously transmits the content data via the transmitter 28 and the transmitting antenna 16.

[0036] As shown in the enlarged diagram at the lower part of Figure 4, each time unit (TU) is formed of a comparatively long first period Tp and a relatively short second period Tf after the first period Tp. In this embodiment, the first period Tp lasts 14 minutes and 45 seconds, and the second period Tf lasts 15 seconds.

[0037] The receiving/reproducing terminal 20 receives characters or very simple graphics information in real time and displays them on the LCD 74 during the first period Tp, and displays images including moving pictures in real time

on the LCD 74 during the second period Tf.

[0038] The enlarged diagram in Figure 4 also illustrates a detailed configuration of the content data Dtu included in the time unit TU. In the first period Tp, program data Dp, which is the first-period content data, and CM data Dcm1, which is second-period first content data, are sent. In the second period Tf, CM command data Dcm2, which is the second-period second content data, is sent. That is, the content data Dtu is formed of Dp and Dcm1 in the first period Tp, and of Dcm2 in the second period Tf.

[0039] An ID code for identifying the program data Dp is inserted at the head of the program data Dp in the first period Tp, while an ID code for identifying the CM command data Dcm2 is inserted at the head of the CM command data Dcm2 in the second period Tf. Both ID codes are also used for synchronization while the data is received and reproduced.

[0040] In the first period Tp, as shown in the enlarged diagram of Figure 4, the total data rate (the entire bandwidth), i.e., 6.4 kbps, is divided. More specifically, three quarters of the total data rate, i.e., 4.8 kbps, is assigned to the program data Dp to be reproduced in real time in the first period Tp, and the remaining one fourth of the total data rate, i.e., 1.6 kbps, is allocated to the CM data Dcm1 to be reproduced in the second period Tf. In the second period Tf, the total data rate, i.e., 6.4 kbps, is assigned to the CM command data Dcm2 for the second period Tf.

[0041] Figure 5 is a flowchart that illustrates a receiving and reproducing process performed by the receiving/reproducing terminal 20, according to one embodiment of the present invention. When the broadcast receiving mode is selected by the mode switching key 78M with the power on, the receiving/reproducing terminal 20 is ready to continuously receive data in step 501. At this time, radio waves including content data sent from the transmitting apparatus 18 as broadcast waves via the transmitter 28 and the transmitting antenna 16 are received by the receiving antenna 50 for use in the receiving/reproducing terminal 20. After the RF signal is converted into an IF signal by the RF processor 52, the IF signal is demodulated and is decoded into serial data by the decoder 54. The serial data is then converted into parallel data by the SPI 56 and is output to the system bus 46.

[0042] In step 502, the above-described ID code for identifying the program data Dp and the ID code for identifying the CM command data Dcm2 are decoded by the decoder 54. The CPU 44 next determines, in step 503, whether the data is the program data Dp or the CM command data Dcm2 based on the decoded ID code. If it is determined that the data is the program data Dp, the program is reproduced in step 504, and the CM data Dcm1 is stored in step 505. In step 502, the ID codes may be decoded by the CPU 44.

[0043] In the program reproducing process of step 504, the program data Dp is reproduced in real time. More specifically, among the program data Dp, sound data is output as sound via the DAC 64, the amplifier 66, and the speaker 68, while character data, simple image data, and graphics data are displayed on the LCD 74 via the GDC/decoder 70 and the LCDC 72. While the program data Dp is being reproduced in real time in step 504, the CM data Dcm1, which is the second-period first content data, is sequentially stored in the data memory 62 via the memory interface 60 in step 505.

[0044] The processing from step 501 to step 505 is repeated for the first period Tp (i.e., 14 minutes and 45 seconds), the CM command data Dcm2 is received, and after the determination made in step 503, the process proceeds to the step 506.

[0045] In step 506, the CM data Dcm1 stored in the data memory 62 is read based on the CM command data Dcm2 received in real time. Then, in step 507, image processing and decoding processing (data expansion) are performed on the CM data Dcm1 by the GDC/decoder 70 based on the content of the CM command data Dcm2. As a result, the CM image, which is graphics display data and moving pictures processed by a high-efficiency compression encoding technique, is displayed on the LCD 74 in real time via the LCDC 72. Simultaneously, sound is reproduced and output via the DAC 64, the amplifier 66, and the speaker 68, if necessary.

[0046] For the embodiment illustrated in Figure 5, the processing of steps 501, 502, 503 (CM), 506, and 507 is repeated for the second period Tf (i.e., 15 seconds).

[0047] Figure 6 is a diagram illustrating the reproduction data rate (reproducing bandwidth), which is partially overlapped with the program schedule 100 shown in Figure 4. In Figure 6, in the first period Tp (14 minutes and 45 seconds) of the time unit TU, the program data Dp, which is the content data formed of character information and simple graphics reproducible even at a relatively low data rate, i.e., 4.8 kbps, is reproduced in real time. In this case, three quarters of the total data rate (6.4 kbps), i.e., 4.8 kbps, is assigned to the program data Dp, and the remaining one fourth of the total data rate, i.e., 1.6 kbps, is allocated to the transmission of the CM data Dcm1. CM data Dcm1 is the second-period first content data to be reproduced in the second period Tf (15 seconds).

[0048] During the first period Tp (14 minutes and 45 seconds), the CM data Dcm1, which is the second-period first content data, is sequentially stored in the data memory 62 of the receiving/reproducing terminal 20. That is, at the start of the second period Tf, the amount of data expressed by the following equation (1) is stored.

$$(1.6\ \text{kbps}/8) \times (14 \times 60\ \text{seconds} + 45\ \text{seconds}) = 177\ \text{kbytes} \quad (1)$$

[0049] Since all the data rate (6.4 kbps) can be used in the second period Tf, the data rate at the second period Tf results in 100.8 kbps (see Figure 6), as expressed by the following equation (2).

$$(177 \text{ kbytes}/15 \text{ seconds}) + (6.4 \text{ kbps}/8) = 12.6 \text{ kbytes/second} = 100.8 \text{ kbps} \quad (2)$$

[0050] The data rate of 100.8 kbps, obtained as described above, is approximately twice as high as currently used highest-speed household modems, i.e., 56 kbps. It is also about three times as high as the high data rate of PHS terminals, i.e., 32 kbps, and approximately ten times as high as the data rate of cellular telephones, i.e., 9.6 kbps. At this data rate, graphics display data and moving pictures reflecting the high-efficiency encoding technique can be displayed in real time.

[0051] In practice, the actual data rate should be calculated by using the effective data rate obtained by subtracting the redundancy data rate, which takes up of a few percent to a few tens of percent of the data rate calculated by the equations (1) and (2). Even at this decreased data rate, moving pictures can be sufficiently reproduced.

[0052] According to the foregoing embodiment, in the first period Tp of the time unit TU, the total data rate 6.4 kbps is divided into 4.8 kbps and 1.6 kbps, and by using the respective data rates, the program data Dp to be reproduced in real time and the second-period CM data Dcm1 are transmitted from the transmitting apparatus 18. In the first period Tp, the receiving/reproducing terminal 20 reproduces the character-based program data Dp in real time and displays it on the LCD 74, and also stores the second-period CM data Dcm1 in the data memory 62. In the second period Tf, the data stored in the data memory 62 is read, and based on this data and the CM command data Dcm2 transmitted in real time at the total data rate, i.e., 6.4 kbps, high data-rate CM moving pictures can be reproduced on the LCD 74 in real time.

[0053] With this arrangement, by utilizing a transmission infrastructure such as a beeper system having a bandwidth small enough to be received by the portable and simple receiving/reproducing terminal 20, high-quality graphics and moving pictures, which cyclically (regularly) require a large bandwidth, can be received and reproduced for a certain period of time.

[0054] In the first period Tp having a low reproduction data rate, characters and sound, or simple graphics are received and reproduced, and then, in the second period Tf having a high reproducing rate, moving pictures are reproduced. In this manner, in the receiving/reproducing terminal 20, two types of media, which require both a high data rate and a low data rate can be received and reproduced. As a consequence, the receiving/reproducing terminal 20 becomes more convenient for the user, and is also used more efficiently by the content provider and the company whose terminals 22 and 24 are connected to the public-line network 12.

[0055] It is also possible to insert high data-rate data, such as CM data, between programs, which are character-based content data, thereby enabling the construction of a media system which is commercially most effective.

[0056] As is seen from the foregoing embodiment, the present invention offers several advantages over present systems. For example, content is transmitted as data from the transmitting apparatus at a fixed transmission data rate, and the receiving/reproducing terminal cyclically increases or decreases the reproduction data rate when receiving the data and reproducing the content. Accordingly, with an increased reproduction data rate, data requiring a high data rate, such as image data, can be reproduced in real time as content. With a decreased reproduction data rate, data that can be reproduced even at a low data rate, such as character data, can be reproduced in real time as content.

[0057] A certain ratio of the total transmission data rate is saved for reproducing high data-rate data later, and such data is temporarily stored in the storage device of the receiving/reproducing terminal. Thereafter, the data is cyclically reproduced at a high data rate in the receiving/reproducing terminal. Accordingly, data can be cyclically reproduced at a high data rate as content.

[0058] As a result, according to the present invention, even by utilizing an infrastructure having a comparatively low data rate, data requiring a high data rate, such as images, can be cyclically reproduced in real time.

[0059] It should be noted that the present invention is not limited only to the disclosed embodiment. On the contrary, the invention is intended to cover various modifications and equivalent arrangements included within the spirit and scope of the appended claims.

[0060] In the foregoing, a broadcast system and a receiving/reproducing terminal for reproducing broadcast content in real time has been described. Although the present invention has been described with reference to specific exemplary embodiments, it will be evident that various modifications and changes may be made to these embodiments without departing from the broader spirit and scope of the invention as set forth in the claims. Accordingly, the specification and drawings are to be regarded in an illustrative rather than a restrictive sense.

Claims

1. A broadcast system transmitting and receiving content as data in real time, comprising:

a transmitting apparatus transmitting the data at a fixed transmission data rate; and

a receiving/reproducing terminal located within a broadcast range of the transmitting apparatus, the receiving/reproducing terminal receiving the data and reproducing the content by cyclically increasing or decreasing a reproduction data rate.

2. A broadcast system according to claim 1, wherein said transmitting apparatus transmits the data by dividing the data into time units, each of the time units being divided into a first period and a second period, first-period data and second-period first data being transmitted in the first period, and second-period second data being transmitted in the second period, and wherein said receiving/reproducing terminal receives the first-period data and the second-period first data in the first period, and receives the second-period second data in the second period.

3. A broadcast system according to claim 2, wherein the receiving/reproducing terminal comprises a storage device, and in the first period, the receiving/reproducing terminal reproduces the received first-period data in real time and also stores the received second-period first data in said storage device, and in the second period, the receiving/reproducing terminal reads the second-period first data from the storage device and reproduces the content from the read second-period first data and the second-period second data.

4. A broadcast system according to claim 2 wherein the second-period first data comprises image data, and the second-period second data comprises command data for reproducing the image data.

5. A broadcast system according claim 3 wherein the second-period first data comprises image data, and the second-period second data comprises command data for reproducing the image data.

6. A receiving/reproducing terminal comprising:

a data receiving unit receiving content as data in real time at a fixed data rate; and
a data reproducing unit coupled to the data receiving unit, the data reproducing unit reproducing the content from the received data by cyclically increasing or decreasing the data rate.

7. A receiving/reproducing terminal according to claim 6, further comprising a receiver circuit configured to receive the data transmitted from a broadcast system over a wireless medium, and wherein the data comprises first period data transmitted during a first period of a time interval defined by the broadcast system and second period data transmitted during a second period of the time interval.

8. A receiving/reproducing terminal according to claim 7 wherein the first period data comprises first period first data and second period first data, and the second period data comprises second period second data.

9. A receiving/reproducing terminal according to claim 8, further comprising:

a storage device storing the second period first data during the first period of time; and
an audio reproduction circuit; and
a display device displaying content reproduced from either the first period data or the second period data.

10. A receiving/reproducing terminal according to claim 9 wherein the receiving/reproducing terminal reproduces the received first-period first data in real time and stores the received second-period first data in said storage device, and in the second period, said receiving/reproducing terminal reads the second-period first data from the storage device and reproduces the content from the read second-period first data and the second-period second data.

11. A receiving/reproducing terminal according to claim 10 wherein the second period first data comprises image data and the second period second data comprises command data for reproducing the image data.

12. A receiving/reproducing terminal according to claim 11 wherein the display device reproduces graphic content within the image data and the audio reproduction circuit reproduces audio content within the image data.

13. A method of transmitting and receiving content as data in real time comprising the steps of:

transmitting the data at a fixed transmission data rate from a broadcasting system to a remote receiving/repro-

ducing terminal of one or more remote receiving/reproducing terminals;
receiving the data at the remote receiving/reproducing terminal; and
reproducing the data at the remote receiving/reproducing terminal by cyclically increasing or decreasing a reproduction data rate at the remote receiving/reproducing terminal.

14. A method according to claim 13 further comprising the step of transmitting the data from the broadcasting system to the remote receiving/reproducing terminal over a wireless broadcast medium.

15. A method according to claim 14 wherein the step of cyclically increasing or decreasing a reproduction data rate comprises the step of dividing the data into time units, each of the time units being divided into a first period and a second period.

16. A method according to claim 15 further comprising;

dividing the first period into a first bandwidth and a second bandwidth;
transmitting first period first data in the first bandwidth of the first period;
transmitting second period first data during the second bandwidth of the first period; and
transmitting second period second data during the second period.

17. A method according to claim 16 further comprising the steps of;

inserting a first identification code in front of the first period data; and
inserting a second identification code in front of the second period data.

18. A method according to claim 16 further comprising the step of storing the received second-period first data in a storage device coupled to the receiving/reproducing terminal.

19. A method according to claim 18 further comprising the steps of:

reading the second-period first data from said storage device; and
reproducing the content from the read second-period first data and the second-period second data.

20. A method according to claim 19 further comprising the steps of:

reproducing graphic elements of the content on a display device of the receiving/reproducing terminal; and
reproducing audio elements of the content on an audio circuit of the receiving/reproducing terminal.

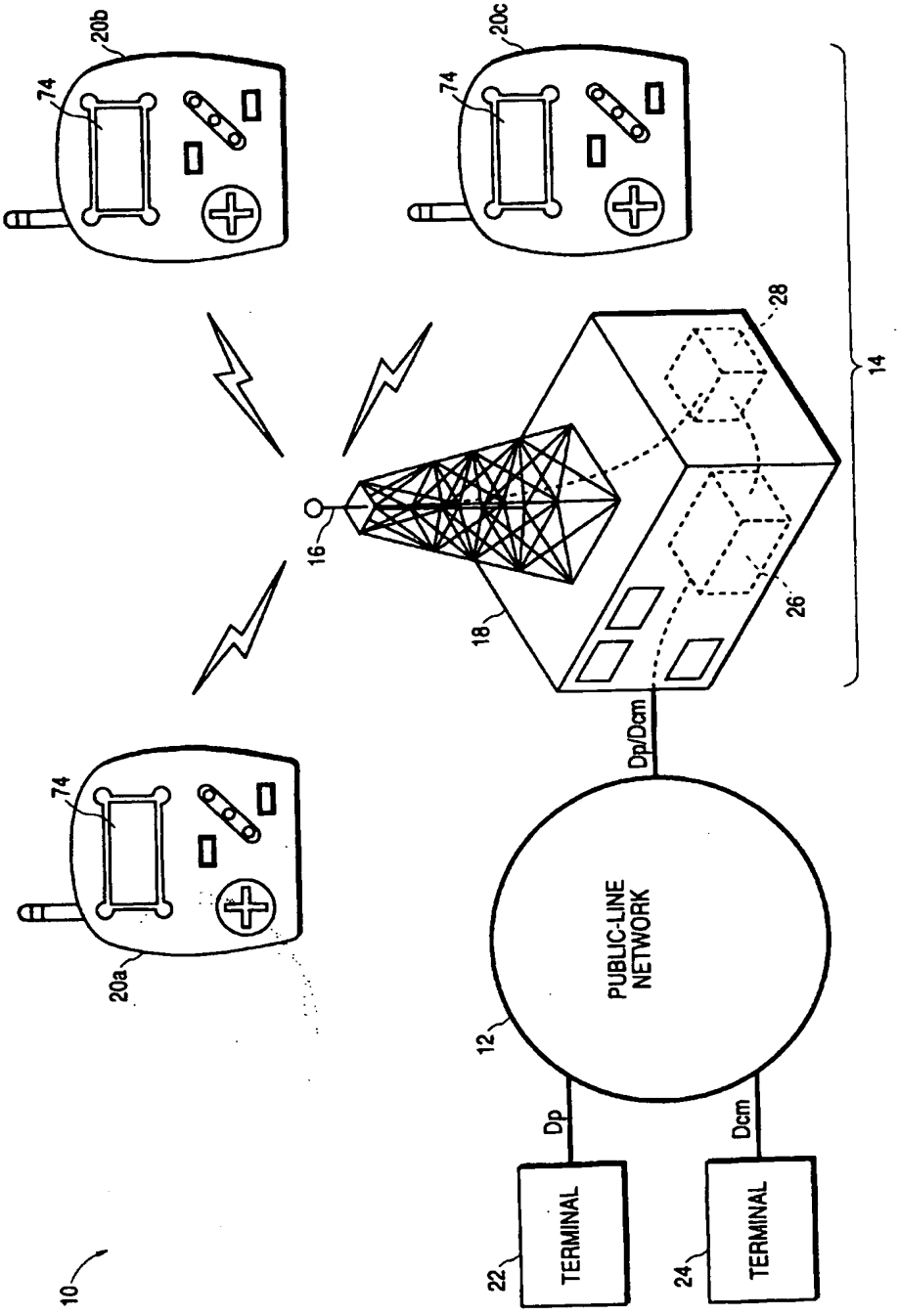
10
20a
20b
20c
74
16
18
26
28
14
Dp/Dcm
PUBLIC-LINE NETWORK
12
Dp
Dcm
TERMINAL
22
TERMINAL
24

FIG.1

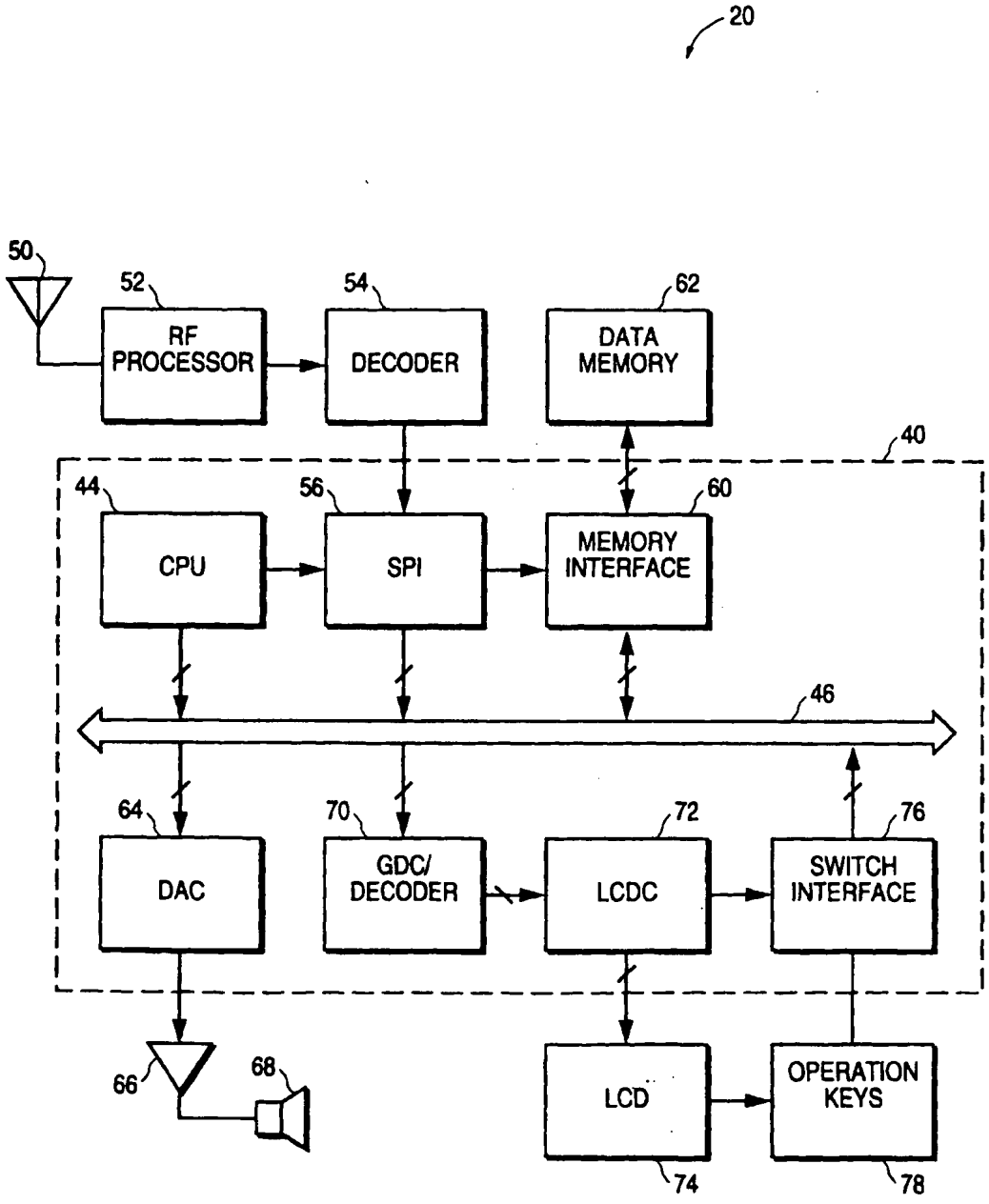
20
50
52
RF PROCESSOR
54
DECODER
62
DATA MEMORY
40
44
CPU
56
SPI
60
MEMORY INTERFACE
46
64
DAC
70
GDC/ DECODER
72
LCDC
76
SWITCH INTERFACE
66
68
LCD
74
OPERATION KEYS
78

FIG.2

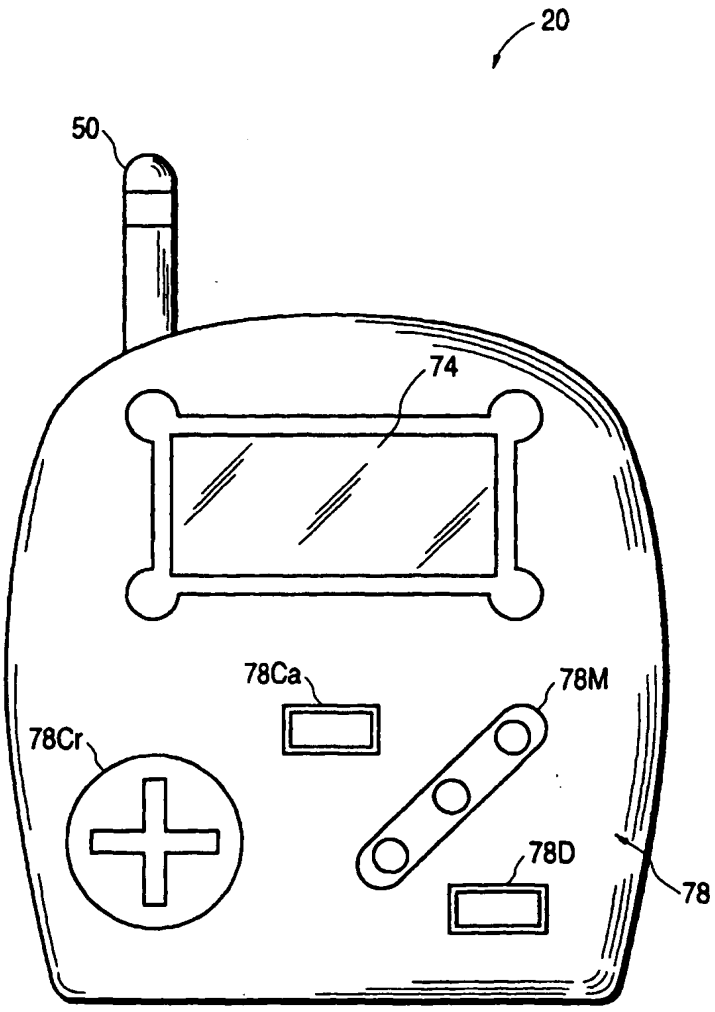

FIG.3

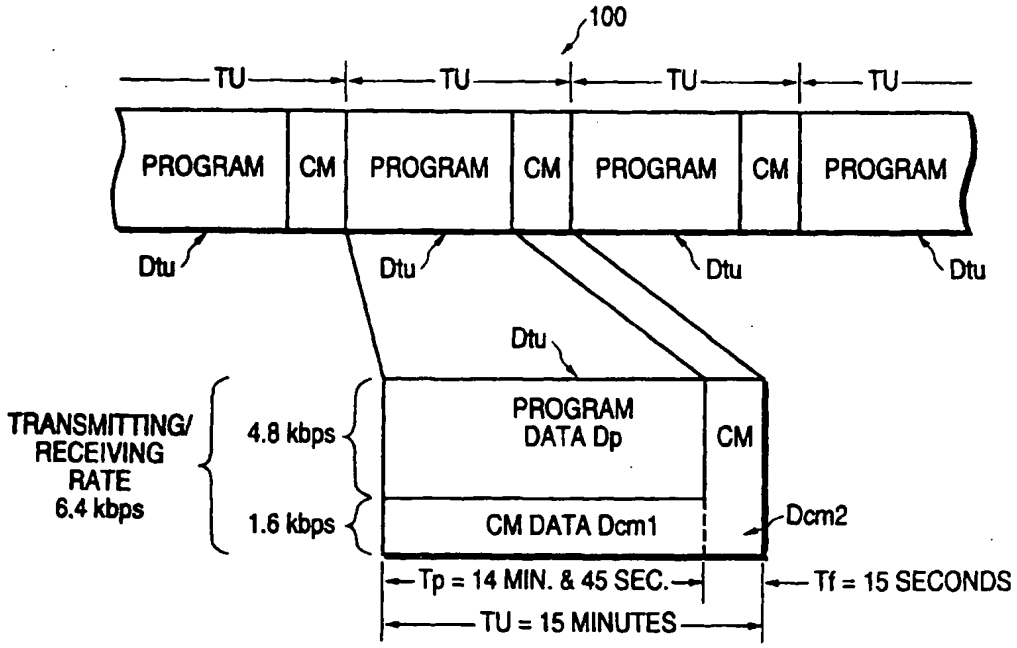
100
TU
TU
TU
TU
PROGRAM
CM
PROGRAM
CM
PROGRAM
CM
PROGRAM
Dtu
Dtu
Dtu
Dtu
Dtu
TRANSMITTING/
RECEIVING
RATE
6.4 kbps
4.8 kbps
1.6 kbps
PROGRAM
DATA Dp
CM
CM DATA Dcm1
Dcm2
Tp = 14 MIN. & 45 SEC.
Tf = 15 SECONDS
TU = 15 MINUTES

FIG.4

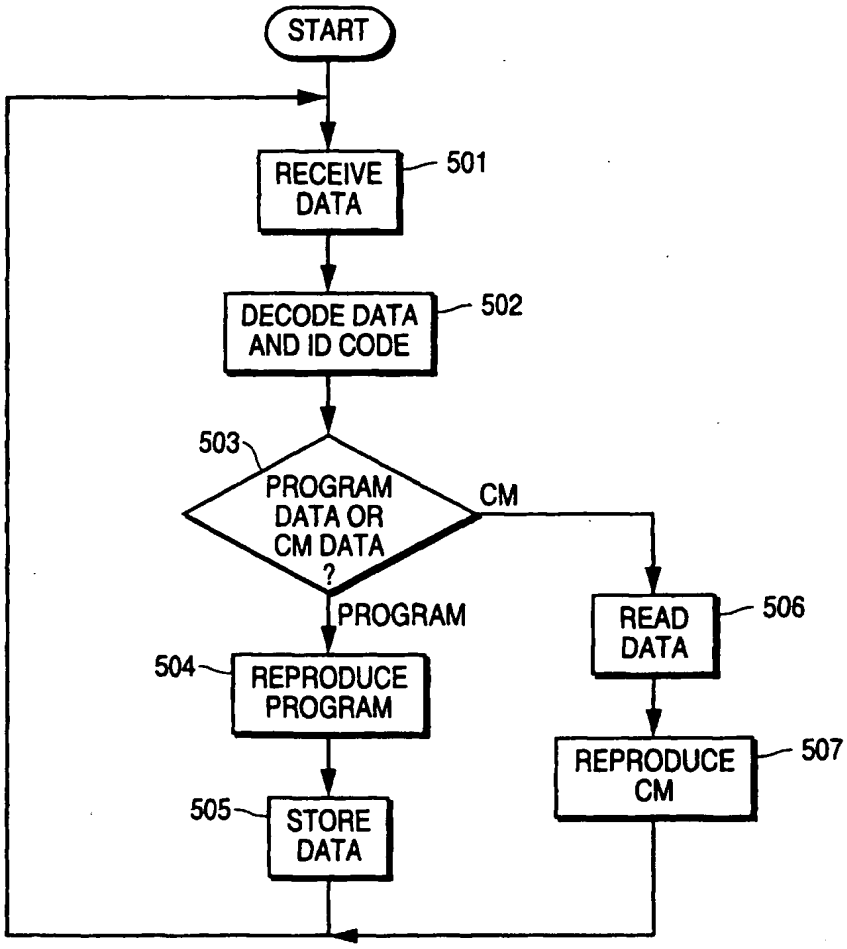
START
RECEIVE DATA
501
DECODE DATA AND ID CODE
502
503
PROGRAM DATA OR CM DATA ?
CM
PROGRAM
READ DATA
506
504
REPRODUCE PROGRAM
REPRODUCE CM
507
505
STORE DATA

FIG.5

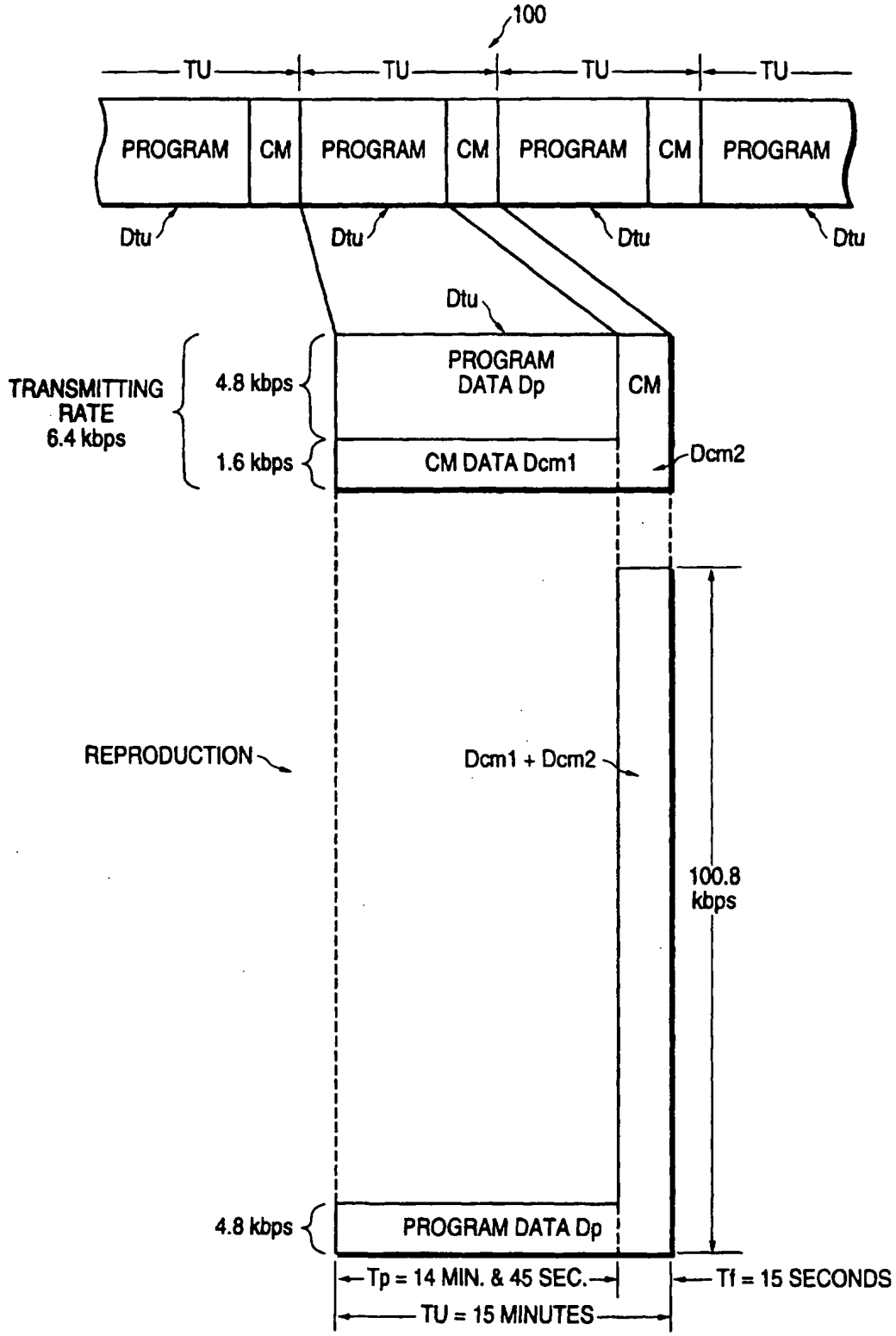
100
TU
TU
TU
TU
PROGRAM
CM
PROGRAM
CM
PROGRAM
CM
PROGRAM
Dtu
Dtu
Dtu
Dtu
Dtu
TRANSMITTING RATE 6.4 kbps
4.8 kbps
1.6 kbps
PROGRAM DATA Dp
CM
CM DATA Dcm1
Dcm2
REPRODUCTION
Dcm1 + Dcm2
100.8 kbps
4.8 kbps
PROGRAM DATA Dp
Tp = 14 MIN. & 45 SEC.
Tf = 15 SECONDS
TU = 15 MINUTES

FIG.6